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Aviation Safety: Airline Management Self-audit

ICARUS Committee Report

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About the Cover: *The cover is reprinted from the November 1992 Flight Safety Digest, which pictures a reproduction of "The Fall of Icarus" by the 18th-century illustrator, Picaret, courtesy of the Smithsonian Institution's National Air & Space Museum, Washington, D.C., U.S.*

Flight Safety Foundation is an international membership organization dedicated to the continuous improvement of flight safety. Nonprofit and independent, FSF was launched in 1945 in response to the aviation industry's need for a neutral clearinghouse to disseminate objective safety information, and for a credible and knowledgeable body that would identify threats to safety, analyze the problems and recommend practical solutions to them. Since its beginning, the Foundation has acted in the public interest to produce positive influence on aviation safety. Today, the Foundation provides leadership to more than 660 member organizations in 77 countries.

Foreword

History and experience have shown that adequate margins of flight safety can be achieved only by the genuine commitment of *all* personnel within an airline. This means that responsibility for flight safety begins at the *top of the organization and requires the active support and commitment of senior management*, as well as that of line-maintenance and operational personnel.

One of the most powerful tools available to management is honest and critical self-assessment. To assist in such a self-appraisal, the Flight Safety Foundation (FSF) ICARUS Committee, comprising a group of recognized international specialists in aviation, has developed an Airline Management Self-audit for airline management and their senior staff. The self-audit's primary function is to help management identify areas of vulnerability so that appropriate corrective and preventive measures can be taken before there is a serious incident or an accident.

The FSF Airline Management Self-audit was designed for use throughout the airline industry, but some details will not apply to every organization. There are no numerical values applied to answers and no passing or failing final score; the aim is to stimulate thought about the many factors that affect flight safety.

For instance, "Is management selected from inside or outside the company?" has no right or wrong answer but is included in the audit because this and other questions can stimulate thought and discussion about issues that might have flight-safety implications.

For every question, the manager should be able to provide an answer and provide a rationale for the answer. Inability to articulate the reason for a policy is a warning flag. If a significant number of warnings are revealed in the overall self-audit, or in one section of the self-audit, management should fully review the appropriate policies and practices.

Because this is a *self-audit*, its utility will depend on an honest, forthright approach to evaluating the issues identified in the process. Its only purpose is to improve flight safety by stimulating appropriate management action. The ultimate benefit will accrue to all concerned — the company, its employees and the traveling public.

— FSF ICARUS Committee

Aviation Safety: Airline Management Self-audit

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FSF ICARUS Committee

Objective

This self-audit is for use by senior airline management to identify administrative, operational and maintenance processes and related training that might present safety problems. The results are to be used to focus management attention on areas that require remediation to prevent incidents and accidents.

Management and Organization

Management Structure

- ❑ Does the company have a formal, written statement of corporate safety policies and objectives?
- ❑ Are these adequately disseminated throughout the company? Is there visible senior management support for these safety policies?
- ❑ Does the company have a flight safety department or a designated flight safety officer?
- ❑ Is this department or safety officer effective?
- ❑ Does the department/safety officer report directly to senior corporate management, to officers or the board of directors?
- ❑ Does the company support periodic publication of a safety report or newsletter?
- ❑ Does the company distribute safety reports or newsletters from other sources?
- ❑ Is there a formal system for regular communication of safety information between management and employees?
- ❑ Are there periodic company-wide safety meetings?
- ❑ Does the company actively participate in industry safety activities, such as those sponsored by Flight Safety Foundation (FSF), International Air Transport Association (IATA) and others?
- ❑ Does the company actively and formally investigate incidents and accidents? Are the results of these investigations disseminated to other managers? To other operating personnel?
- ❑ Does the company have a confidential, nonpunitive incident-reporting program?
- ❑ Does the company maintain an incident data base?
- ❑ Is the incident data base routinely analyzed to determine trends?
- ❑ Does the company use outside resources to conduct safety reviews or audits?
- ❑ Does the company actively solicit and encourage input from aircraft manufacturers’ product-support groups?

Management and Corporate Stability

- ❑ Have there been significant or frequent changes in ownership or senior management within the past three years?
- ❑ Have there been significant or frequent changes in the leadership of operational divisions within the company in the past three years?
- ❑ Have any managers of operational divisions resigned from the company because of disputes about safety matters, operating procedures or practices?

Financial Stability of the Company

- ❑ Has the company recently experienced financial instability, a merger, an acquisition or major reorganization?
- ❑ Was explicit consideration given to safety matters during and following the period of instability, merger, acquisition or reorganization?
- ❑ Are safety-related technological advances implemented before they are dictated by regulatory requirement, i.e., is the company proactive in using technology to meet safety objectives?

Management Selection and Training

- ❑ Is there a formal management-selection process?
- ❑ Are there well-defined management-selection criteria?
- ❑ Is management selected from inside or outside the company?
- ❑ Is operational background and experience a formal requirement in the selection of management personnel?
- ❑ Are first-line operations managers selected from the most operationally qualified candidates?
- ❑ Do new management personnel receive formal safety indoctrination or training?
- ❑ Is there a well-defined career path for operations managers?
- ❑ Is there a formal process for the annual evaluation of managers?
- ❑ Is the implementation of safety programs a specific management objective considered in the evaluation?

Work Force

- ❑ Have there been recent layoffs by the company?
- ❑ Are a large number of personnel employed on a part-time or contract basis?
- ❑ Does the company have formal rules or policies to manage the use of contract personnel?
- ❑ Is there open communication between employees and management?
- ❑ Is there a formal means of communication among management, the work force and labor unions about safety issues?
- ❑ Is there a high rate of personnel turnover in operations and maintenance?
- ❑ Is the overall experience level of operations and maintenance personnel low or declining?
- ❑ Is the distribution of age or experience level within the company considered in long-term company plans?
- ❑ Are the professional skills of candidates for operations and maintenance positions evaluated formally in an operational environment during the selection process?
- ❑ Are multicultural processes and issues considered during employee selection and training?
- ❑ Is special attention given to safety issues during periods of labor-management disagreements or disputes?
- ❑ Are the safety implications of deteriorating morale considered during the planning and implementation of reduction in work force or other destabilizing actions?
- ❑ Have there been recent major changes in wages or work rules?
- ❑ Does the company have a company-wide employee health maintenance program that includes annual medical examinations?
- ❑ Does the company have an employee-assistance program that includes treatment for drug and alcohol abuse?

Fleet Stability and Standardization

- ❑ Is there a company policy concerning cockpit standardization within the company's fleet?
- ❑ Do pilots/flight-operations personnel participate in fleet-acquisition decisions?

Relationship with the Regulatory Authority

- ❑ Are company safety standards set primarily by the company or by the appropriate regulatory authority?
- ❑ Does the company set higher safety standards than those required by the regulatory authority?
- ❑ Do the company's safety standards meet or exceed U.S. Federal Aviation Regulations (FARs)/European Joint Aviation Requirements (JARs) criteria?
- ❑ Does the company have a constructive, cooperative relationship with the regulatory authority?
- ❑ Has the company been subject to recent safety-enforcement action by the regulatory authority?
- ❑ Does the regulatory authority refuse to recognize the licenses issued by some other countries?
- ❑ Does the company evaluate the licensing requirements of other countries when deciding whether to hire personnel who hold licenses issued by those countries?
- ❑ Does the company consider the differing experience levels and other licensing standards of other countries when reviewing applications for employment?
- ❑ Does the regulatory authority routinely evaluate the company's compliance with required safety standards?

Operations Specifications

- ❑ Does the company have formal flight-operations control, e.g., dispatch or flight following?
- ❑ Does the company have special dispatch requirements for extended twin-engine operations (ETOPS)?
- ❑ Are fuel/route requirements determined by the regulatory authority?
- ❑ If not, what criteria does the company use?
- ❑ Does each crew member get copies of the pertinent operations specifications?

Operations and Maintenance Training

Training and Checking Standards

- ❑ Does the company have written standards for satisfactory performance?
- ❑ Does the company have a defined policy for dealing with unsatisfactory performance?
- ❑ Does the company maintain a statistical data base of trainee performance?
- ❑ Is this data base periodically reviewed for trends?
- ❑ Is there a periodic review of training and checking records for quality control?
- ❑ Are check pilots periodically trained and evaluated?
- ❑ Does the company have established criteria for instructor/check-pilot qualification?
- ❑ Does the company provide specialized training for instructors/check pilots?
- ❑ Are identical performance standards applied to captains and first officers?
- ❑ Are training and checking performed by formally organized, independent departments?
- ❑ How effective is the coordination among flight operations, flight training and flight standards?

Operations Training

- ❑ Does the company have a formal program for training and checking instructors?
- ❑ Is there a recurrent training and checking program for instructors?
- ❑ Does the company have required training and checking syllabi?

Does this training include:

- ❑ Line-oriented flight training (LOFT)?
- ❑ Crew resource management (CRM)?
- ❑ Human factors?
- ❑ Wind shear?
- ❑ Hazardous materials?
- ❑ Security?
- ❑ Adverse weather operations?
- ❑ Altitude and terrain awareness?
- ❑ Aircraft performance?
- ❑ Rejected takeoffs?
- ❑ ETOPS?
- ❑ Instrument Landing System (ILS) Category II and Category III approaches?
- ❑ Emergency-procedures training, including pilot/flight attendant interaction?

- ❑ International navigation and operational procedures?
- ❑ Standard International Civil Aviation Organization (ICAO) radio-telephone phraseology?
- ❑ Volcanic-ash avoidance/encounters?

❑ If a ground-proximity warning system (GPWS), traffic-alert and collision avoidance system (TCAS) and other special systems are installed, is specific training provided for their use? Are there clearly established policies for their use?

❑ Are English-language skills evaluated during training and checking?

❑ Is English-language training provided?

❑ At a minimum, are the procedures contained in the manufacturer's aircraft operations manual covered in the training program?

❑ Is initial operating experience (IOE) mandated?

❑ Is first/second officer IOE required to be conducted "in seat" rather than in the observer's seat?

❑ Are there formal means for modification of training programs as a result of incidents, accidents or other relevant operational information?

Training Devices

❑ Are approved simulators available and used for all required training?

❑ Is most of the company's training performed in the simulator?

❑ Do the simulators include GPWS, TCAS, background communications and other advanced features?

❑ Are simulators and/or training devices configuration-controlled?

❑ Has the company established a simulator/training device quality-assurance program to ensure that these devices are maintained to acceptable standards?

❑ Does the regulatory authority formally evaluate and certify simulators?

Flight Attendant Training

❑ Do flight attendants receive comprehensive initial and recurrent safety training?

❑ Does this training include hands-on use of all required emergency and safety equipment?

❑ Is the safety training of flight attendants conducted jointly with pilots?

❑ Does this training establish policies and procedures for communications between cockpit and cabin crew?

❑ Are evacuation mock-up trainers that replicate emergency exits available for flight attendant training?

Maintenance Procedures, Policies and Training

❑ Does the regulatory agency require licensing of all maintenance personnel?

❑ Is formal maintenance training provided by the company for all maintenance personnel? Is such training done on a recurrent basis? How is new equipment introduced?

❑ Does the company have a maintenance quality assurance program?

❑ If contract maintenance is used, is it included in the quality assurance program?

❑ Is hands-on training required for maintenance personnel?

❑ Does the company use a minimum equipment list (MEL)?

❑ Does the company's MEL meet or exceed the master MEL?

❑ Does the company have a formal procedure covering communications between maintenance and flight personnel?

❑ Are "inoperative" placards used to indicate deferred-maintenance items? Is clear guidance provided for operations with deferred-maintenance items?

❑ Are designated individuals responsible for monitoring fleet health?

❑ Does the company have an aging-aircraft maintenance program?

❑ Is there open communication between the maintenance organization and other operational organizations, such as dispatch? How effective is this communication?

❑ Does the company use a formal, scheduled maintenance program?

- ❑ Are policies established for flight and/or maintenance personnel to ground an aircraft for maintenance?
- ❑ Are flight crew members ever pressured to accept an aircraft that they believe must be grounded?
- ❑ Are flight crews authorized to ground an aircraft for maintenance?

Scheduling Practices

- ❑ Are there flight- and duty-time limits for pilots?
- ❑ Are there flight- and duty-time limits for flight attendants?
- ❑ Do the flight- and duty-time limits meet or exceed FARs/JARs requirements?
- ❑ Do flight- and duty-time limits apply regardless of the type of operation, e.g., cargo, passenger, ferry, charter?
- ❑ Does the company train flight crew members to understand fatigue, circadian rhythms and other factors that affect crew performance?
- ❑ Does the company allow napping in the cockpit?
- ❑ Are on-board crew-rest facilities provided or required?
- ❑ Are there minimum standards for the quality of layover rest facilities?
- ❑ Does the company have a system for tracking flight- and duty-time limits?
- ❑ Has the company established minimum crew-rest requirements?
- ❑ Are augmented crews used for long-haul flights?
- ❑ Are circadian rhythms considered in constructing flight crew schedules?
- ❑ Are there duty-time limits and rest requirements for maintenance personnel?

Crew Qualifications

- ❑ Does the company have a system to record and monitor flight crew currency?

  Does the record-keeping system include initial qualification, proficiency checks and recurrent training, special airport qualifications, line-check observations and IOE observations for:

  - ❑ Pilots in command?
  - ❑ Seconds in command?
  - ❑ Flight engineers?
  - ❑ Instructors and check pilots?
  - ❑ Flight attendants?
- ❑ Does the regulatory authority provide qualified oversight of instructor and check-pilot qualification?
- ❑ Are the company simulator instructors line-qualified pilots?
- ❑ Does the company permit multiple aircraft qualification for line pilots?
- ❑ Do company check pilots have complete authority over line-pilot qualification, without interference from management?
- ❑ If the company operates long-haul flights, does the company have an established policy for pilot currency, including instrument approaches and landings?
- ❑ Does the company have specific requirements for pilot-in-command and second-in-command experience in type for crew scheduling?

Manuals and Procedures

- ❑ Does the company have an airline operations manual?
- ❑ Is the airline operations manual provided to each crew member?
- ❑ Is the airline operations manual periodically updated?

  Does the airline operations manual define:

  - ❑ Minimum numbers of flight crew members?
  - ❑ Pilot and dispatcher responsibilities?
  - ❑ Procedures for exchanging control of the aircraft?
  - ❑ Stabilized-approach criteria?
  - ❑ Hazardous-materials procedures?
  - ❑ Required crew briefings for selected operations, including cockpit and cabin crew members?
  - ❑ Specific predeparture briefings for flights in areas of high terrain or obstacles?
  - ❑ Sterile-cockpit procedures?
  - ❑ Requirements for use of oxygen?
  - ❑ Access to cockpit by nonflight crew members?
  - ❑ Company communications?
  - ❑ Controlled flight into terrain (CFIT)-avoidance procedures?

- ❏ Procedures for operational emergencies, including medical emergencies, and bomb threats?
- ❏ Aircraft deicing procedures?
- ❏ Procedures for handling hijacking and disruptive passengers?
- ❏ Company policy specifying that there will be no negative consequences for go-arounds and diversions when required operationally?
- ❏ The scope of the captain's authority?
- ❏ A procedure for independent verification of key flight-planning and load information?
- ❏ Weather minima, maximum cross- and tail-wind components?
- ❏ Special minima for low-time captains?

❏ Are emergency escape routes developed and published for flights in areas of high terrain?

❏ Are all manuals and charts subject to a review and revision schedule?

❏ Does the company have a system for distributing time-critical information to the personnel who need it?

❏ Is there a company manual specifying emergency-response procedures?

❏ Does the company conduct periodic emergency-response drills?

❏ Are airport-facility inspections mandated by the company?

❏ Do airport-facility inspections include reviews of notices to airmen (NOTAMs)? Signage and lighting? Runway condition, such as reverted rubber accumulations, foreign object damage (FOD), etc.? Crash, fire and rescue availability? Navigational aids (NAVAIDS)? Fuel quality?

Dispatch, Flight Following and Flight Control

❏ Does initial/recurrent dispatcher training meet or exceed FARs/JARs requirements?

❏ Are operations during periods of reduced crash, fire and rescue (CFR) equipment availability covered in the company flight operations manual?

❏ Do dispatchers/flight followers have duty-time limitations?

❏ Are computer-generated flight plans used?

❏ Are ETOPS alternates specified? ♦

About the FSF ICARUS Committee

The FSF ICARUS Committee was formed in 1992 to seek philosophical and practical ideas to reduce human error in aviation by addressing the fundamental question of why experienced and well-trained people commit errors that result in accidents. The committee, which promotes open discussion of aviation safety issues, comprises individuals with extensive and diverse backgrounds in the human aspects of aviation design, manufacturing, flight and maintenance operations, operating environments and research.

The name ICARUS was chosen by committee members for its symbolic value. In Greek mythology, Icarus plunged into the sea after his newly designed wax-and-feather wings melted as he flew too close to the sun. Thus Icarus became the first to suffer an "accident" because of human error resulting from incorrect behavior, ignorance of the operating environment, poor decision making and design deficiencies.

Another ICARUS Committee Special Report that focused on management's role in air safety, "The Dollars and Sense of Risk Management and Airline Safety," was published in the December 1994 Flight Safety Digest*.*

United States and Canada Had Disproportionately Low Number of Commercial Jet Transport Accidents in 1995

Africa, with 4 percent as many departures as the United States and Canada, had 90 percent as many accidents during the year.

FSF Editorial Staff

Of the 44 commercial jet transport accidents worldwide in 1995, 10 occurred in the United States and Canada (Figure 1, page 8). Nine of the year's commercial jet transport accidents occurred in Africa, which had 4 percent as many departures as the United States and Canada — 360,578 compared with 8,057,425 (Figure 2, page 9) — according to statistics released by McDonnell Douglas Corp.

Of the 20 hull-loss accidents in 1995, nine were fatal accidents. Compared with 1994, there were more accidents in the takeoff phase and more accidents attributed to unsafe acts — "misjudge[d] altitude," "[loss of] directional control" and "[failure] to go around." Seventeen 1995 accidents were attributed to flight crew error, compared with 22 in 1994. (Variations from one year to the next cannot be assumed to reflect a meaningful trend, because the data sample is too small and differences may result from random variation.)

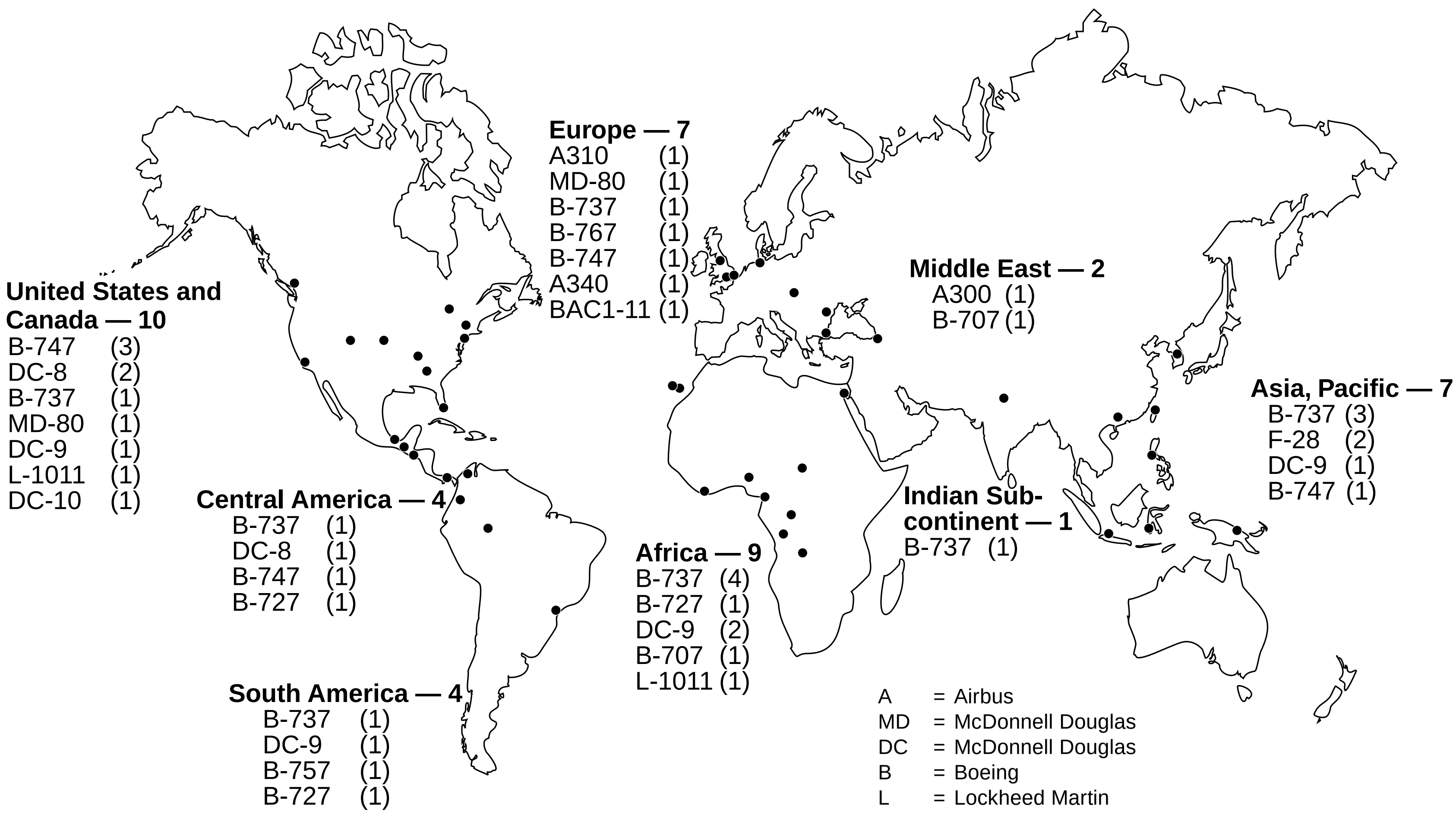
Europe and the Asia/Pacific region each had seven commercial jet transport accidents in 1995. The 3,720,228 departures in Europe represented 46 percent of the number of departures in the United States and Canada, and the 2,447,499 departures in the Asia/Pacific region were 30 percent of the figure for the United States and Canada.

Fifteen of the 44 accidents (34 percent) and 11 of the 20 hull-loss accidents (55 percent) to commercial jet transports in 1995 were weather related. McDonnell Douglas's breakdown of weather factors (Figure 3, page 10) shows that turbulence was a factor in nine of the accidents, followed in frequency by heavy rain, rain and winds. Fog, the second most frequently cited weather factor in the 1958–1995 period, as reported by McDonnell Douglas, played no role in any 1995 accident.

The figures appeared in the McDonnell Douglas booklet *Commercial Jet Transport: Aircraft Accident Statistics 1995.*

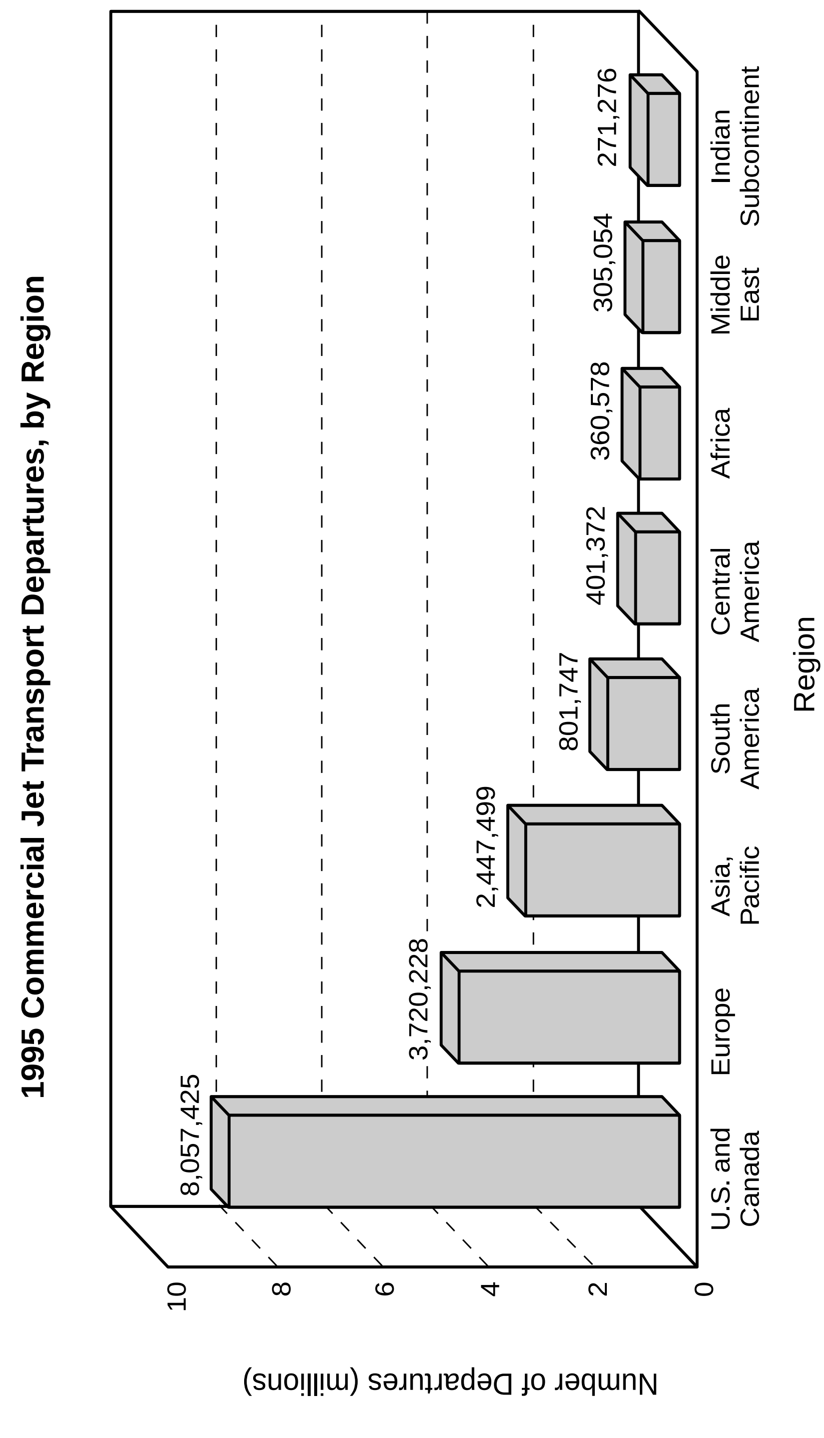
The statistics excluded accidents in which neither the aircraft's equipment, nor its crew, nor its flight operational procedures were factors. Only commercial jet transports manufactured by companies based in the United States or western Europe were included in the data.♦

1995 Commercial Jet Transport Accidents, by Region



Source: McDonnell Douglas Corp.

Figure 1



Source: McDonnell Douglas Corp.

Figure 2

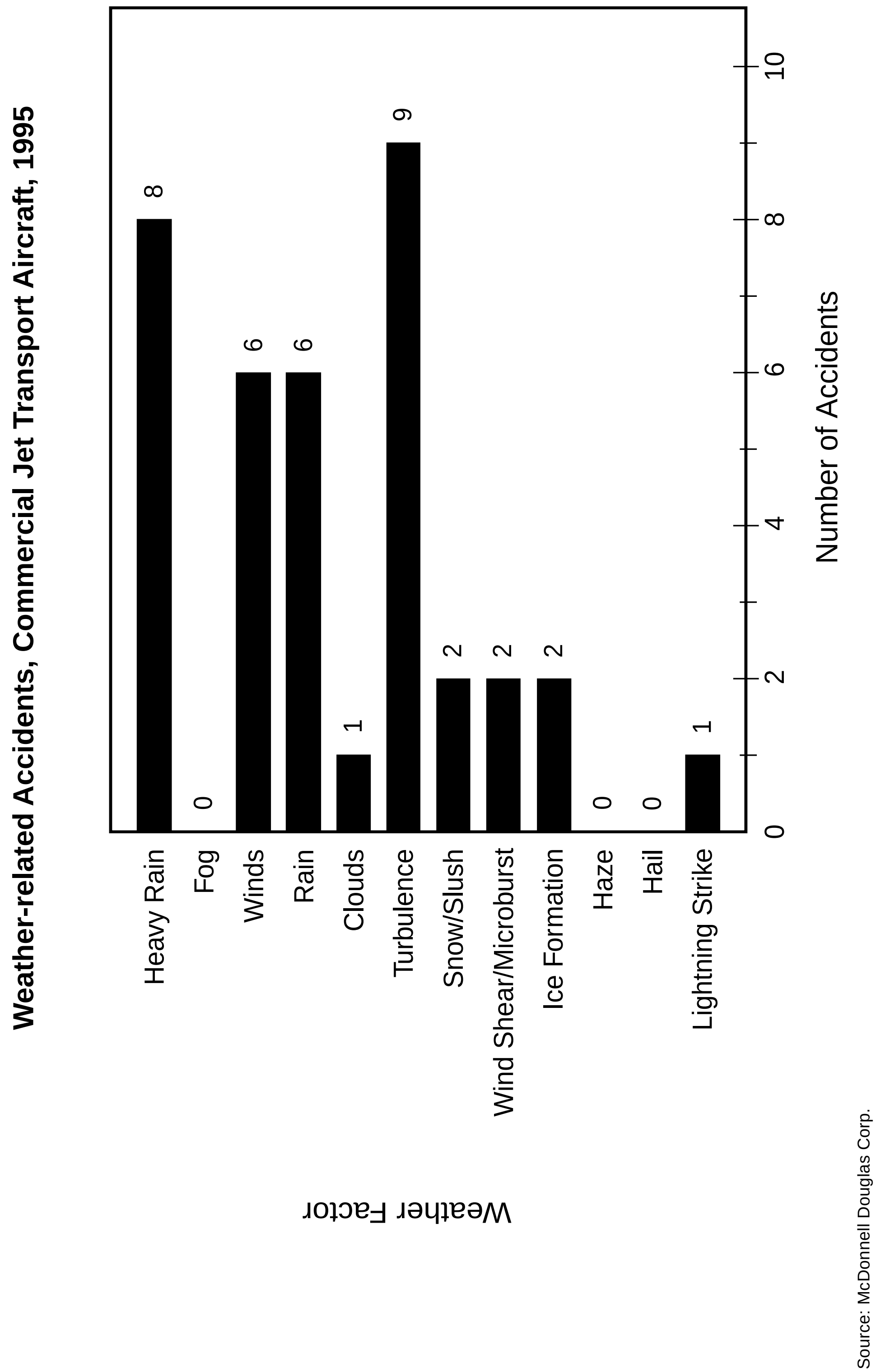

Weather-related Accidents, Commercial Jet Transport Aircraft, 1995
Weather Factor
Heavy Rain
Fog
Winds
Rain
Clouds
Turbulence
Snow/Slush
Wind Shear/Microburst
Ice Formation
Haze
Hail
Lightning Strike
8
0
6
6
1
9
2
2
2
0
0
1
0
2
4
6
8
10
Number of Accidents
Source: McDonnell Douglas Corp.

Figure 3

Publications Received at FSF Jerry Lederer Aviation Safety Library

Successful Crew Responses to In-flight Emergencies Are Recounted in Book

FAA Advisory Circular offers guidance for air carrier use of electronic checklists.

FSF Editorial Staff

Advisory Circulars (ACs)

Announcement of Availability: Flight Standards Service Airman Testing and Training Information. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 6-26. April 18, 1996. 2 pp. Available through GPO.*

This AC provides information on how to access the FAA Flight Standards Service section of the FedWorld electronic bulletin board, which contains information about pilot certification and skill testing.

This AC provides instructions on how to dial into FedWorld via computer modem. FedWorld can also be accessed via Telnet by typing *fedworld.gov* or via the Internet through file-transfer protocol (FTP) site *ftp://ftp.fedworld.gov/pub/faa-att/faa-att.htm* or the FedWorld World Wide Web site at *http://www.fedworld.gov*.

Control of Products and Parts Shipped Prior to Type Certificate Issuance. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 21-32A. March 19, 1996. 4 pp. Available through GPO.*

This AC provides a means to control products and parts shipped prior to the issuance of a type certificate (TC) or supplemental type certificate (STC) by a manufacturer with an approved production inspection system or production certificate. This AC expands AC 21-32, *Control of Products and Parts Shipped Prior to Type Certificate Issuance*, dated Oct. 14, 1992, by including completed aircraft, aircraft engines, propellers and parts shipped prior to TC/STC issuance.

Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5100-17. March 29, 1996. 64 pp. Figures, appendices. Available through GPO.*

This AC provides guidance to sponsors of airport projects developed under the Airport Improvement Program (AIP) to meet the requirements of 49 Code of Federal Regulations (CFR) Part 24, "Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs." Sponsoring land-acquisition and relocation programs must comply with this regulation on any federally assisted airport project funded under the AIP.

Chapters in this AC address general requirements, property appraisal, property acquisition, relocation assistance requirements, property management and sponsor certification. Appendix 1 provides a list of FAA-recommended forms. Appendix 2 outlines the requirements for replacement-housing payment eligibility. Appendix 3 describes the sponsor quality-control program, land-acquisition and location-assistance projects; and Appendix 4 provides guidelines for sponsor certification of title.

FAA DAR, DAS, DOA and SFAR Part 36 Directory. U.S. Federal Aviation Administration (FAA) Advisory Circular

(AC) 183-35F. March 28, 1996. 30 pp. Appendices. Available through GPO.*

This AC consists of a consolidated directory of FAA Designated Airworthiness Representatives (DARs) for maintenance and manufacturing, Organizational Designated Airworthiness Representatives (ODARs) for maintenance and manufacturing, Designated Alteration Stations (DASs), manufacturing organizations with Delegation Option Authorizations (DOAs) and organizations certified as of Jan. 23, 1996. This AC also lists functions that each of the above representatives or organizations is authorized to perform. This updated directory supersedes AC 183-35E, *FAA DAR, DAS, DOA and SFAR Part 36 Directory*.

Estimated Airplane Noise Levels in A-Weighted Decibels. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 36-3G. April 2, 1996. 20 pp. Appendices. Available through GPO.*

This AC provides listings of estimated aircraft noise levels for aircraft that have been noise-type certified under U.S. Federal Aviation Regulations (FARs) Part 36 and also for aircraft for which no requirement presently exists. Two lists are provided in this AC: One gives the noise levels for aircraft on takeoff; the other lists aircraft noise levels on approach. Aircraft on both lists are ranked according to estimated sound levels in A-weighted decibels (dBA) from loudest to softest.

[The A-weighting system corrects for the ear's varying sensitivity at different frequency levels, rating the loudness of sounds according to the subjective impression of sound strength, rather than the actual decibel level.]

This AC cancels AC 36-3F, *Estimated Airplane Noise Levels in A-Weighted Decibels*, dated Aug. 10, 1990.

Commercial Assistance During Construction of Amateur-Built Aircraft. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 20-139. April 3, 1996. 14 pp. Appendices. Available through GPO.*

This AC provides guidance and information to persons involved in the construction of amateur-built aircraft. (An amateur-built aircraft, as defined by U.S. Federal Aviation Regulations [FARs] Part 21, is "an aircraft the major portion of which has been fabricated and assembled by persons who undertook the construction project solely for their own education or recreation.")

Sections in this AC include a definition of terms, an evaluation of aircraft construction kits, requirements for commercial assistance and a brief description of information supplied by the amateur-built aircraft industry to prospective customers and to purchasers.

Appendix 1 contains a sample FAA Form 8000-38, *Fabrication Assembly Operation Checklist*, which is recommended as a guide for the evaluation of a completed aircraft built from a nonevaluated kit. Appendix 2 contains a sample FAA Form 8130-12, *Eligibility Statement Amateur-Built Aircraft*, which is one of the forms to be submitted for a special airworthiness certificate.

Operational Use and Modification of Electronic Checklists. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 120-64. April 24, 1996. 10 pp. Appendix. Available through GPO.*

This AC is intended to facilitate the development and modification of electronic checklists (ECLs) and ECL data by air carriers. This AC also offers guidance for air carriers that are integrating ECLs into their crew resource management and training programs. The information applies particularly to air carriers using installed ECL systems under Federal Aviation Regulations (FARs) Parts 121 or 135, although operators under FARs Parts 91 or 125 may also use the criteria that are pertinent to their own aircraft and operations.

Sections in this AC include "ECL certification and Operational Approval," "Flightcrew Qualification for the Use of ECLs," "Training Device and Simulator Characteristics" and "Operating Experience, Line Checks and Route Checks." This AC also contains a glossary of ECL-related terms.

Pilot Proficiency Award Program. U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 61-91H. April 26, 1996. 4 pp. Available through GPO.*

The pilot proficiency award program is intended to provide pilots with the opportunity to participate in personal, recurrent proficiency training. All pilots holding at least a recreational pilot certificate and a current medical certificate are eligible to participate, as are uncertificated pilots of qualified ultralight air vehicles. This AC describes the training requirements for each phase of the program, from Phase I to Phase XX. On completion of each phase, pilots are presented with a distinctive lapel- or tie-pin and a certificate.

Announcement of Availability: FAA-S-8081-17, Private Pilot Practical Test Standards for Lighter-Than-Air (Balloon/Airship). U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 61-124. May 15, 1996. 2 pp. Available through GPO.*

This AC provides information on how to obtain *FAA-S-8081-17, Private Pilot Practical Test Standards for Lighter-Than-Air (Balloon/Airship)*. In addition to price and ordering information for printed copies of this document, the AC also announces that electronic copies are accessible via the electronic bulletin board FedWorld. (This document can be obtained on the Internet through FTP site *ftp://ftp.fedworld.gov/pub/faa-att/faa-att.htm* or the FedWorld World Wide Web site at *http://www.fedworld.gov*.)

Reports

A Formative Evaluation of the Collegiate Training Initiative — Air Traffic Control Specialist (CTI-ATCS) Program. Morrison, John E.; Fotouhi, Carolyn Hill; Broach, Dana. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report no. DOT/FAA/AM-96/6. February 1996. 52 pp. Tables, references, appendix. Available through NTIS.**

Keywords:
1. Air Traffic Control Specialists (ATCS)
2. Training Program Evaluation
3. Recruitment
4. Selection
5. Education

The purpose of the FAA collegiate training initiative-air traffic control specialist (CTI-ATCS) program is to test the concept that civil educational institutions can develop and implement recruitment, selection and training programs for air traffic controllers. This report describes the initial evaluation of the CTI-ATCS Program.

This report presents the background and development of the program and also describes the institutions involved in the training of CTI-ATCS participants. Elements examined in each training program include the gender and ethnic makeup of the students, coursework requirements and innovations by the participating institutions. As a result of this evaluation, the report concludes that the CTI-ATCS program appears to be successful: Innovations observed in recruitment and selection procedures may benefit the FAA. In addition, efforts to recruit minorities and women show some progress. Nevertheless, improvements are needed in program management and communications. Concern for the future of the CTI-ATCS program is also expressed because of the decrease in demand for air traffic controllers.

Determination of Effective Thoracic Mass. Marcus, Jeffrey H. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report no. DOT/FAA/AM-96/7. February 1996. 29 pp. Figures, tables. Available through NTIS.**

Keywords:
1. Crash Dummy
2. Side Impact
3. Thorax
4. Effective Mass

Knowing the effective mass of thoracic components is crucial to obtaining accurate results in crash-impact studies; both computer and mechanical models using incorrect effective masses produce results that vary significantly from the results of similar, real crashes. This report examines one method for determining effective thoracic mass.

To assess the method, data from a number of previous human-cadaver crash tests were analyzed, and the effective thoracic mass was computed. The effective thoracic mass was then computed for crash-test dummies subjected to identical test conditions. The two results were compared.

This report concludes that the total effective thoracic mass of the test dummies was generally greater than the effective thoracic mass of the cadavers. Values for side-impact rib mass in test dummies corresponded most closely to values for their cadaver counterparts; other values, such as side-impact spinal mass and all frontal-impact masses, diverged significantly.

Qualification Guidelines for Personal Computer-based Aviation Training Devices: Instrument Training. Williams, Kevin W. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report no. DOT/FAA/AM-96/8. February 1996. 68 pp. Tables, figures. Available through NTIS.**

Keywords:
1. Personal Computers
2. Flight Training
3. Psychology
4. Memory

This report examines the development of qualification guidelines for personal computer–based aviation training devices (PCATDs) for use in instrument flight training. These qualification guidelines, used in combination with a soon-to-be-released FAA Advisory Circular, will enable pilot schools to gain approval for the use of PCATDs in their ground- and flight-training curricula under Federal Aviation Regulations (FARs) Part 141. The report features an analysis of instrument flight tasks and also includes baseline and task-specific guidelines that were developed as a result of this analysis.

DOT's Budget: Challenges Facing the Department in Fiscal Year 1997 and Beyond. Statement of John H. Anderson Jr., director, Transportation Issues, Resources, Community, and Economic Development Division, U.S. General Accounting Office (GAO), before the Subcommittee on Aviation, Committee on Appropriations, U.S. House of Representatives, March 7, 1996. Report no. GAO/T-RCED-96-88. 38 pp. Available through GAO.***

John H. Anderson testified about the effects that efforts to reduce the federal budget will have on U.S. Department of Transportation (DOT) responsibilities. Anderson's testimony addressed issues related to the Federal Highway Administration, Amtrak and the U.S. Coast Guard as well as to the U.S. Federal Aviation Administration (FAA).

The FAA has projected a funding shortfall of more than US$12 billion between 1997 and 2002; the GAO is reviewing the accuracy of this estimate. To compensate for limited resources, the FAA will have to operate more efficiently and identify opportunities to increase revenue.

To avoid future cost overruns and schedule delays such as those that currently hinder the air traffic control (ATC) modernization program, Anderson recommended that the FAA resolve fundamental problems in its organizational culture. Anderson also noted that the FAA has already reduced funding for technical training for inspectors and expressed concern that funding limitations may adversely affect safety issues.

Appendix 1 notes the status of FAA major modernization projects. Appendix 2 provides a summary of costs and schedules for these same projects.

Airport Improvement Program: Military Airport Program and Reliever Set-Aside Update. Statement of John H. Anderson Jr., director, Transportation Issues, Resources, Community, and Economic Development Division, U.S. General Accounting Office, before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, U.S. House of Representatives, March 13, 1996. Report no. GAO/T-RCED-96-94. 6 pp. Figures. Available through GAO.***

This paper transcribes the testimony of John H. Anderson presented in GAO Reports GAO/RCED-94-209, *Airport Improvement Program: The Military Airport Program Has Not Achieved Intended Impact* and GAO/RCED-94-226, *Airport Improvement Program: Reliever Airport Set-aside Funds Could be Redirected*. Anderson reported on the status of the military airport program (MAP) and the reliever-airport set-aside fund.

The MAP was established to help convert military airports in congested metropolitan areas to civilian aviation use. The set-aside fund was created by Congress to decrease congestion at commercial airports and to provide general aviation access at additional airports. The goal of both projects was to enhance airport and air-traffic capacity in urban areas.

The 1994 report (GAO/RCED-94-209) stated that nine of the 12 military airports chosen for the MAP failed to meet key program goals — they were not in congested areas, they were not likely to increase air-traffic capacity or they had been operating as joint or civilian airports for at least 10 years. In response to GAO recommendations, the FAA tightened eligibility criteria for MAP funding.

Anderson noted that seven of the 12 MAP airports originally selected have since "graduated" from the program and are no longer eligible for funding; the remaining five are expected to graduate by the end of fiscal year 1997. In addition, two airports that meet the revised, stricter criteria and have not previously participated in MAP have been identified.

In GAO/RCED-94-226, GAO reported that the objectives for the reliever set-aside program no longer existed; the FAA did not consider general aviation to be a significant factor in commercial airport congestion. Although there has been a noteworthy increase in larger general aviation aircraft such as turboprop and turbojets, most airports presently designated as reliever facilities are not able to accommodate them.

Blinks, Saccades, and Fixation Pauses During Vigilance Task Performance: II. Gender and Time of Day. Stern, John. A.; Boyer, Donna J.; Schroeder, David J.; Touchstone, R. Mark; Stoliarov, N. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report no. DOT/FAA/AM-96/9. March 1996. 44 pp. Figures, tables, references. Available through NTIS.**

Keywords:
1. Fatigue
2. Eye Movements
3. Time-On-Task
4. Vigilance

This collaborative research project, developed through the U.S.–Russian Aviation Medicine and Human Factors Working Group, studied the eye movements of air traffic control (ATC) operators to determine the impact of task and situational factors such as fatigue on operator vigilance and performance. The subjects, 25 air traffic controllers, performed a simulated ATC task for two successive hours each day over a three-day period. Gaze-control measures (i.e. blinks, saccades and fixations) were recorded at intervals throughout each simulation. [Saccades are quick, jerky shifts in gaze.]

The report concluded that the female subjects blinked significantly more often and longer than the males; the number of gaze-control measures increased for both sexes over the course of the task period. Study results also suggested that female subjects who participated in evening task periods were more alert and sustained their level of alertness better than women who participated in morning task periods. Male subjects appeared to be more alert in the morning. The authors of this report expressed interest in whether these gender distinctions can be replicated in subsequent studies.

Methods and Metrics of Voice Communications. Kanki, Barbara G.; Prinzo, O. Veronika. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report no. DOT/FAA/AM-96/10. March 1996. 285 pp. Figures, appendices, references. Available through NTIS.**

Keywords:
1. ATC Communication
2. Discourse Processes
3. Acoustic Processes

This report contains the proceedings of the Methods and Metrics of Voice Communication workshop held in San

Antonio, Texas, U.S., May 13–14, 1994. The purpose of this workshop was to further the understanding of communication processes and problems in aviation operations. The proceedings are divided into three sections: 1) papers presented on discourse and acoustic processes; 2) demonstrations of software designed to collect, code and analyze communication data and 3) two appendices of supplementary materials.

The papers presented at the workshop included "Managing Problems in Speaking," "Pilot and Controller Communication Issues," "How to Say It and How Much: The Effect of Format and Complexity on Pilot Recall of Air Traffic Control Clearances," "Subjects Concerning Audio-tape Analysis," "Speech Analysis in Russia" and "Development of a Speech-analysis Protocol for Accident Investigation." OCS TOOLS, MacSHAPA and Aviation Topic — Speech Act Taxonomy (ATSAT) were the software tools demonstrated. The appendices contain such previously published articles as "Anatomy of a System Accident: The Crash of Avianca Flight 052," "Collaboration in Controller-Pilot Communication," "A Coding Form for Approach Control/Pilot Voice Communications," "Selected Topics in Forensic Voice Identification" and "Enhancement of Forensic Audio Recordings."

Dynamic Performance of High Bypass Ratio Turbine Engines with Water Ingestion. Murthy, S.N.B. U.S. National Aeronautics and Space Administration (NASA) Contractor Report 4703. U.S. Federal Aviation Administration (FAA) Report no. DOT/FAA/AR95-96. April 1996. 26 pp. Figures, references. Available through NTIS.**

Keywords:
1. Turbomachinery
2. Water Ingestion
3. Turbine Engines

This is the U.S. National Aeronautics and Space Administration (NASA) Lewis Research Center's report on studies conducted on the effects of water contamination in turbofan engines. The focus of this research was to develop and test a series of ingestion codes that would determine the performance of various parts of the engine during contamination. This report noted that the distribution of water in the turbomachinery changes continuously; therefore, the performance of engine components as well as of the total engine system is time-dependent, and procedures for water clearance must also be time-dependent to be effective. The report concludes that the research already conducted has provided sufficient background for full-scale tests on engine components and complete engines.

International Aviation: DOT's Efforts to Increase U.S. Airlines' Access to International Markets. Statement of John H. Anderson, Jr., director, Transportation Issues, Resources, Community, and Economic Development Division, U.S. General Accounting Office (GAO), before the Subcommittee on Aviation, Committee on Commerce, Science and Transportation, U.S. Senate, March 14, 1996. Report no. GAO/T-RCED-96-32. 17 pp. Tables, appendices. Available through GAO.***

John Anderson, Jr., testified about the success of the U.S. Department of Transportation (DOT) efforts to increase airline access to the United Kingdom. The United Kingdom is currently the largest U.S. aviation trading partner overseas; because of Britain's market size and its location, which makes it a key gateway to Europe, Africa and the Middle East, U.S. airlines especially desire increased access to Heathrow Airport outside London.

Anderson's testimony focused on the United States' limited leverage in its negotiations with the United Kingdom. Leverage is limited chiefly because British Airways, the United Kingdom's major airline, already has a satisfactory level of access to the U.S. market through its alliance with USAir. In addition, further concessions sought by the United Kingdom in return for greater access to Heathrow involve significant departures from traditional U.S. trade policies. Nevertheless, Anderson emphasized the possibility that economic analysis and other options, such as bringing the U.S. trade representative in to aid DOT with the negotiations or forming an advisory panel of U.S. airlines, airports and consumer groups, may strengthen the U.S. bargaining position.

The appendices list U.S. cities that currently have access to Heathrow, total passengers carried on scheduled services between the United States and Heathrow, carrier services between the United States and the London airports (both Heathrow and Gatwick) and U.S. government contract fares to London from Washington, D.C., U.S.; San Francisco, California, U.S.; Tampa, Florida, U.S.; and Philadelphia, Pennsylvania, U.S.

Airline Deregulation: Changes in Airfares, Service, and Safety at Small, Medium-Sized and Large Communities. Report to the Chairman, Committee on Commerce, Science and Transportation, U.S. Senate. April 1996. Report no. GAO/RCED-96-79. 84 pp. Available through GAO.***

In June 1995, the Chairman of the U.S. Senate Committee on Commerce, Science and Transportation asked GAO to update its 1989 analysis of airfare trends in airports serving small, medium and large communities and to compare changes in the quality, quantity and safety of air service since the enactment of the Airline Deregulation Act of 1978. This report presents the results of that analysis.

This report states that the average fare per passenger mile has fallen since deregulation (fares adjusted for inflation). The largest decreases in fares have occurred at airports in the western and southwestern United States, regardless of the size of the community. The greatest increases in fares are at airports in the Southeast and Appalachian regions. The quantity of air service, measured in terms of number of departures and available seats, has also increased since deregulation for airports serving communities of all sizes. Nevertheless, the report notes that the quality of service is more difficult to assess, because a large number of factors are involved. The report also notes that the accident rate was lower in 1994 than in 1978 but adds that the rate fluctuates from year to year.

Appendix I compares overall changes in fares and service at airports serving small, medium and large communities since deregulation. Appendix II compares fares per passenger mile for the years 1979, 1984, 1988, 1991 and 1994; Appendix III presents sampling errors for the estimates of these fares. Appendices IV and VI list the number of scheduled departures and seats at sample airports for May 1978 and May 1995. Appendix V lists the number of destinations for the sample airports.

Airport and Airway Trust Fund: Effects of the Trust Fund Taxes' Lapsing on FAA's Budget. Report to the Ranking Minority Member, Subcommittee on Transportation and Related Agencies, Committee on Appropriations, House of Representatives. April 1996. Report no. GAO/RCED-96-130. 10 pp. Appendices. Available through GAO.***

The Airport and Airway Trust Fund was established by the Airport and Airway Revenue Act of 1970 to finance U.S. Federal Aviation Association (FAA) construction and safety improvement projects at airports well as upgrades to the air traffic control system. Money for the trust fund was received from taxes on air travel, air cargo transport and noncommercial aviation fuels, until these taxes expired in December 1995. The report provides information on the status of the trust fund.

The U.S. Government Accounting Office (GAO) reports that there is sufficient money in the trust fund to finance its portion of the FAA fiscal year 1996 budget. The FAA estimates that the expired taxes must be reinstated no later than December 1996 to enable the trust fund to finance its portion of the 1997 budget. Money not derived from the trust fund for FAA projects must be taken from the general fund. For each month beyond December 1996 during which the trust fund receives no new money from the expired taxes, the general fund must provide an additional $550 million to compensate for the loss.

Appendix I contains FAA funding history from 1990 to 1996. Appendix II projects the trust fund's estimated balance if the taxes are not reinstated.

Dummy and Injury Criteria for Aircraft Crashworthiness. Marcus, Jeffrey H. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report no. DOT/FAA/AM-96/11. April 1996. 6 pp. Tables, figures, references. Available through NTIS.**

In response to the 1988 FAA dynamic crash-test requirements for the use of anthropomorphic test dummies (ATDs), this report reviews information on ATDs. Requirements for ATDs are listed, and currently available ATD types are described. This report also discusses briefly the injury criteria used to assess the crashworthiness of aircraft systems.

Ophthalmic Requirements and Considerations for the En Route Air Traffic Control Specialist: An Ergonomic Analysis of the Visual Work Environment. Nakagawara, Van B.; Coffey, James D.; Montgomery, Ronald D. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report no. DOT/FAA/AM-96/12. April 1996. 12 pp. Tables, figures, references. Available through NTIS.**

This ergonomic study examines the visual requirements of the en route air traffic control specialist (ATCS) work environment, which employs a unique radar console unit. The radar console consists of a plan view display, an alphanumeric keyboard, an airways map and a "D" console. Air traffic controllers are required to make frequent and repetitive eye movements to monitor all console components.

To evaluate the range of visual measurements, a vertical stand with a tape measure was placed 10.2 centimeters (four inches) in front of the radar console and measurements from two eye-height levels to the four primary components were obtained. Accommodative range (the adjustment needed to maintain a sharp retinal image), vergence-demand range (the adjustment needed to maintain singular binocular fixation) and other vision-demand measurements were then calculated. Only 17 of the total 80 measurements calculated required less than 15 degrees of eye movement.

This report concludes that the accommodative and convergence demands of working with the en route ATCS console would probably not have a substantial clinical effect on the vision performance of young controllers with normal visual abilities, but version (vertical and horizontal eye movements unaccompanied by head and neck movement) demands are substantial and may be of clinical concern. Head and neck movements that minimize versional eye movements can contribute to muscle fatigue and other ergonomic problems. The report suggests a series of alterations to the console layout to alleviate vision problems.

Differential Prediction of FAA Academy Performance on the Basis of Gender and Written Air Traffic Control Specialist Aptitude Test Scores. Young, Willie C.; Broach, Dana; Farmer, William L. U.S. Federal Aviation Administration (FAA) Office of Aviation Medicine. Report no. DOT/FAA/AM-96/13. April 1996. 18 pp. Tables, figures, references. Available through NTIS.**

This study investigates the technical fairness of the U.S. Office of Personnel Management written air traffic controller (ATC) aptitude test as it applies to female applicants. Eligibility for employment for ATC positions is determined on the basis of a composite of two written-test scores; current mean score differences in favor of male applicants suggest that the test may have an adverse impact on opportunities for women. In addition, an analysis of selection rates indicates that fewer women than men were classified as eligible for employment on the basis of their composite test scores. This study considers the significance of these gender-based differences in light of current equal employment opportunity legislation.

Books

Emergency: Crisis on the Flight Deck. Stewart, Stanley. Shrewsbury, England: Airlife Publishing Ltd., 1992. 264 pp. Photographs, figures, glossary.

The introduction to this book states its thesis: "Airline crews are well-trained, highly motivated and dedicated professionals. Although mistakes are sometimes made and accidents occasionally happen, the high level of safety evident in the airline industry is a testament to the excellent standard maintained by all concerned." In *Emergency*, Stanley Stewart, a British Airways pilot for 18 years, brings together a collection of stories of aircraft emergencies, all of which shared one common factor: flight crews that were faced with extreme situations and emerged from the crisis with no fatalities.

Each chapter describes one serious incident. "Pacific Search" tells of a McDonnell Douglas DC-10 en route from Fiji to New Zealand that was diverted from its flight path to search for a Cessna missing in the South Pacific and escorted the lost airplane to safety before it ran out of fuel. "To Take-off or Not to Take-off," tells of a Boeing 747 that struck an array of runway approach lights during takeoff from San Francisco International Airport. Metal shafts pierced the cargo and cabin sections, injuring several passengers; the plane was forced to return to the airport, landing with extensive damage to the landing gear. In "The Windsor Incident," the cargo-hold door of a DC-10 ejected at 12,000 feet (3,660 meters), rupturing the cabin floor in explosive decompression and nearly sucking out two flight attendants. The aircraft landed safely in spite of major damage to the tail. Subzero weather froze excess water in the fuel tanks of a YS-11 flying between Anchorage, Alaska, U.S., and King Salmon, Alaska, U.S., and ice crystals blocked the fuel filter in "Ice Cool." "Strange Encounter" describes the crisis that occurred when a Boeing 747 encountered an electrical storm and all four engines failed.

Stewart combines factual information from official accident reports, transcripts of flight-deck recordings, ground-ATC communications and interviews with the flight crews to create detailed and dramatic narratives of how each aircraft crew responded to the emergency. In every situation, quick and effective reactions saved lives.

The Art and Science of Flying Helicopters. Coyle, Shawn. Ames, Iowa, United States: Iowa State University Press, 1996. 225 pp. Figures, index.

This is a basic guide to helicopter function and operation for student pilots, professional pilots and instructors. The book is arranged in two parts. The first section, "The Helicopter for Beginners," covers the fundamentals of helicopter theory, performance and flying. Chapter titles include "Introduction to Helicopter Aerodynamics," "Basic Helicopter Performance," "Balance and Weight," "Before You Strap In," "Engine Failure for Beginners," "Introduction to the Flight Manual" and "Peculiarities of the Helicopter." The second, "Advanced Section" provides information for those who are already familiar with helicopters but wish to understand more. Chapters include "Advanced Helicopter Aerodynamics," "Advanced Helicopter Flying," "Balance of Forces and Controlling the Helicopter," "Advanced Engine Failure" and "Further Peculiarities of Helicopter Flight." The book also contains comprehensive information on autorotation.

Bold-face headings and subheadings of decreasing size create easy-to-read sections in each chapter and enable the reader to locate precisely the information required. A glossary is provided at the end of the book.

Aircraft Accident Reconstruction and Litigation. McCormick, B. W.; Papadakis, M.P. Tucson, Arizona, United States: Lawyers and Judges Publishing Co., 1996. 693 pp. Figures, tables, appendices, index. Foreword by Jerry Lederer, Flight Safety Foundation president emeritus.

A successful case depends on reliable evidence. This book provides information and guidelines for experts in aircraft accident reconstruction and lawyers specializing in aviation law on how to conduct investigations and produce evidence suitable for the courtroom. The authors — one an aviation consultant and frequent expert witness, the other an airline pilot and attorney — combine their expertise to instruct the professional accident investigator in data-gathering techniques. This book also outlines the fundamentals of modern aircraft technology and legal theory as they apply to establishing the causes of an accident.

Chapters 2 through 5 examine the basics of aircraft construction and systems. These chapters are titled "Aerodynamics, Performance, Stability and Control"; "Structures, Load factors and Failures"; "Propulsion Systems"; and "Aircraft Systems" (i.e., landing gear, electrical, flight control and fuel systems) respectively. Chapter 6 describes the workings of air traffic control systems and the hazards of flying in adverse weather conditions. Chapter 7 looks at national, international and military agencies, including the U.S. Federal Aviation Administration (FAA), U.S. National Transportation Safety Board (NTSB), U.S. National Aeronautics and Space Administration (NASA) and International Civil Aviation Organization (ICAO). "Causal Factors of Aircraft Accidents and Correlative Results" looks at both pilot error and mechanical failure, and "Determination of Probable Cause" discusses procedures for conducting an on-site investigation, investigative checklists, and sources of reports and recorded information. Chapter 10 discusses "Additional Investigative Techniques," such as air traffic control (ATC) and "black box" recordings, eyewitness interviews, simulator reconstruction, flight and instrument reconstruction and wreckage scatter–chart interpretation. The final chapters, "Concepts of Law" and "Compendium of State Law," review some basic principles of litigation and pertinent federal laws and provide a comprehensive list of significant aviation cases and precedents.

Appendices include a glossary of aviation-related terms, a list of abbreviations and acronyms, tips for aviation litigation and sample requests and order forms for various government agencies.

The Ultralight Pilot's Flight Training Manual. Hughes, Curtis. Ames, Iowa, United States: Iowa State University Press, 1996. 245 pp. Figures, appendices.

The increased popularity of air sports demands an increase in reliable guidelines and training materials for air-sports enthusiasts. This manual, developed by an ultralight pilot and instructor, introduces prospective students to ultralight operation and prepares them for the written, oral and flight tests required by the U.S. Ultralight Association (USUA) in accordance with U.S. Federal Aviation Administration policy on self-regulation within the ultralight industry.

This manual is organized to offer a step-by-step, structured approach to flight instruction. Chapter 1, "Your Flight Training Program," introduces the reader to the USUA and the flight training process and also describes the "lesson-by-lesson" implementation of the training program. Chapter 2 provides basic airwork lessons in ground operations, level flight and coordinated turns, airspeed/altitude control and takeoffs, climbs and descents. Chapter 3 advances to more complex lessons in minimum controllable airspeeds and stalls, emergency procedures and ground-reference maneuvers. Stabilized approaches and normal landings are addressed in Chapter 4. Chapter 5 discusses solo flight. More than 80 illustrations and photographs elucidate the text, and the appendices contain training forms that students can use to track their progress, with the assistance of an instructor.

Commuter Airlines. Wells, Alexander; Richey, Franklin. Melbourne, Florida, United States: Kreiger Publishing, 1996. 245 pp. Figures, appendices, index.

Commuter Airlines is a textbook developed for college-level business aviation courses. The emphasis is on management and operational procedures.

The book is divided into three parts: "Introduction and Background," "Management and Operations" and "The Future." The first section covers the history of commuter airlines, the structure of the industry, the role of commuter airlines in the air transportation system, and the types of aircraft used in the commuter fleet. "Management and Operations" looks at the certification process, market forecasting, aircraft specifications and aircraft selection. The third section examines the outlook for U.S. regional airlines.

Each chapter begins with an outline of the topics covered and a checklist of goals the reader should accomplish by the end of the chapter. For example, readers of Chapter 1 should be able to do the following: "Explain how and why local-service carriers got started after World War II; identify some of the early local-service carriers, and explain why they no longer exist; distinguish between the small irregular airlines and the large irregular airlines; [and] define the term 'commuter airline.'" Key terms and review questions conclude each chapter.♦

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Updated U.S. Federal Aviation Administration (FAA) Regulations and Reference Materials

Advisory Circulars (ACs)

AC No.	Date	Title
150/5060-5	12/01/95	*Airport Capacity and Delay.* (Change 2 to 150/5060-5, *Airport Capacity and Delay,* dated 09/23/83.)
150/5220-21-A	07/26/96	*Guide Specification for Lifts Used to Board Airline Passengers with Mobility Impairments.* (Cancels AC 150/5220-21, *Guide Specification for Lifts Used to Board Airline Passengers with Mobility Impairments,* dated 02/10/93.)
150/5370-10A	09/10/96	*Standards for Specifying Construction of Airports.* (Change 9 to 150/5370-10A, *Standards for Specifying Construction of Airports,* dated 02/17/89.)
00-44HH	08/96	*Status of Federal Aviation Regulations.* (Cancels AC00-44GG, *Status of Federal Aviation Regulations,* dated 07/95.)

U.S. Federal Aviation Regulations (FARs)

Part	Date	Subject
Part 1	08/1/96, 08/19/96	*Definitions and Abbreviations.* (Incorporates Amendment 1-45, "Aircraft Flight Simulator Use in Pilot Training, Testing, and Checking and at Training Centers," adopted 05/23/96, and Amendment 1-46, "Airworthiness Standards: Aircraft Engines, New One-Engine-Inoperative (OEI) Ratings, Definitions and Type Certification Standards," adopted 05/30/96.)
Part 13	12/28/95	*Investigative and Enforcement Procedures.* (Incorporates Amendment 13-25, "Revision of Authority Citations," adopted 12/20/95; Amendment 13-26, "Civil Penalties: Streamlined Enforcement Procedures for Certain Security Violations," adopted 12/23/96.)
Part 61	08/1/96	*Certification: Pilots and Flight Instructors.* (Incorporates Special Federal Aviation Regulation 58-2 and Amendment 61-100, "Aircraft Flight Simulator Use in Pilot Training, Testing, and Checking and at Training Centers," issued 05/23/96.)
Part 71	12/28/95	*Designation of Class A, Class B, Class C, Class D, and Class E Airspace Areas; Airways; Routes; and Reporting Points.* (Incorporates Amendment 71-27, "Revision of Authority Citations," adopted 12/28/95; Amendment 71-28, "Airspace Designations; Incorporation by Reference," adopted 09/14/96.)
Part 91	08/1/96	*General Operating and Flight Rules.* (Incorporates Amendment 91-251, "Aircraft Flight Simulator Use in Pilot Training, Testing, and Checking and at Training Centers," adopted 05/23/96.)
Part 125	08/1/96	*Certification and Operations: Airplanes Having a Seating Capacity of 20 or More Passengers or a Maximum Payload Capacity of 6,000 Pounds or Greater.* (Incorporates Amendment 125-27, "Aircraft Flight Simulator Use in Pilot Training, Testing, and Checking and at Training Centers," adopted 05/23/96.)

Accident/Incident Briefs

Boeing 737 Encounters Unforeseen Turbulence

Night instrument approach through snow squalls and turbulence ends in controlled flight into terrain for Cessna 402.

FSF Editorial Staff

The following information provides an awareness of problems through which such occurrences may be prevented in the future. Accident/incident briefs are based on preliminary information from government agencies, aviation organizations, press information and other sources. This information may not be entirely accurate.

Air Carrier

Turbulence Encounter Injures Three Passengers

Boeing 737-300. Minor damage. Three minor injuries.

The aircraft was in cruise flight at FL 310 (31,000 feet) en route to Mexico City, Mexico, from a U.S. airport when it entered a layer of cirrus clouds. Turbulence in the cloud layer was initially light but quickly became moderate.

The captain illuminated the "fasten seat belt" sign, and the passengers returned to their seats. Turbulence then became severe and lasted about 20 seconds. During this period, the aircraft also encountered heavy rain and hail. Three passengers were slightly injured.

The weather radar was not turned on when the aircraft entered the cirrus layer because buildups were not suspected, and the flight crew could see blue sky above. Weather reports for the flight had forecast no storms or turbulence. A cold front stretched across the Gulf of Mexico to Texas and was forecast to be north of the flight route.

After the initial turbulence encounter, the weather radar was turned on. The display was almost completely red, showing a cell at their 12 o'clock position. Continuous ignition and anti-ice were turned on, and the first officer initiated a turn to the left, which appeared to be the shortest route to avoid the majority of the buildups.

The aircraft encountered the severe turbulence and heavy rain while in the turn and then exited on the other side of the buildups.

One of the injured passengers did not have her seat belt fastened tightly. Two other passengers were changing seats in their seat row, and the encounter caught them with their seat belts unfastened. The aircraft's radome was damaged by hail.

An inquiry determined that the cold front had moved much farther south than had been forecast. Satellite weather imagery indicated numerous buildups in the cirrus layers and tops in excess of 39,000 feet (11,895 meters). Satellite images showed that the aircraft encountered some of the strongest buildups in the frontal zone.

The airline's safety inquiry team stressed the early use of weather radar in low-visibility situations and avoidance procedures. The inquiry also noted that the captain should have been familiar with the kind of weather encountered in the area because this was part of the route familiarization training.

Whiteout Conditions Down Twin with 13 on Board

Beech 100 King Air. Substantial damage. Two fatalities. Seven serious injuries.

The pilot was executing a daylight visual (contact) approach in instrument meteorological conditions (IMC) to Runway 14 when the aircraft struck the frozen surface of a lake about 4.8 kilometers (three miles) north of the Canadian airport. The impact tore off the belly baggage pod and damaged the propellers.

A go-around was initiated, but the pilot decided to land straight ahead because of the way the engines sounded and because of abnormal control responses. The aircraft struck the lake's frozen surface left wing–low. The impact killed two flight crew members and seriously injured two other crew members and five of the nine passengers on board. Four passengers received minor injuries.

An investigation determined that several seats buckled during impact and that three seats failed at their attachment points. The most seriously injured suffered head and back injuries. The approach was conducted with 1.6-kilometer (one-mile) visibility in snow. Whiteout conditions existed over the lake.

Night Instrument Approach Ends in Trees

Beech 18. Substantial damage. One fatality.

The pilot was executing a night instrument landing system (ILS) approach in instrument meteorological conditions (IMC) on a cargo flight when the aircraft collided with trees in mountainous terrain. The pilot was killed, and the twin-engine Beech 18 was substantially damaged.

An investigation determined that the pilot did not follow the ILS procedure and did not maintain the published minimum descent altitude before striking the trees.

Trim-cable Failure Complicates Descent

Beech 1900. Minor damage. No injuries.

The Beech 1900 with four passengers on board was in a daylight descent when the trim-control cable failed. The captain and first officer both had to pull back on the yoke to control pitch.

Flaps were lowered at 240 knots (maximum flap extension speed is 188 knots), which reduced the nose-down control pressure. The aircraft landed uneventfully, and there were no injuries.

An investigation determined that the failed cable was routed over, not under, a guide pin on the pulley at the top of the empennage. The aircraft had 440 hours in service since factory delivery. The first inspection of the cables was scheduled for between 750 hours and 800 hours. The manufacturer has since inspected all aircraft of this type.

Twin Descends Below Minimum Altitude

Beech 200 King Air. Substantial damage. No injuries.

The twin turboprop King Air was on a night distance-measuring equipment (DME) back-course localizer approach when the aircraft descended below the minimum altitude and struck the tops of trees as the crew tried to locate Runway 6 visually.

When the crew became aware of its proximity to the ground, it pulled up and landed on Runway 8. Visibility was reported as 6.4 kilometers (four miles) in light snow, but was deteriorating during the approach. The wings were damaged when the aircraft struck the trees. The two pilots and eight passengers were not injured.

Downdraft Downs Goose

Grumman G21 Goose. Substantial damage. One fatality. One serious injury.

The aircraft was flying about 200 feet (61 meters) above a glacier in Alaska, U.S., when it encountered a severe downdraft. The aircraft struck the glacier surface, killing one pilot and seriously injuring the other.

Two passengers received minor injuries in the daylight accident.

Other General Aviation

Deer Complicates Landing

Cessna 310. Substantial damage. No injuries.

The twin-engine Cessna 310 was making a daylight landing in visual meteorological conditions (VMC) at a Canadian airport when it struck a deer on the runway. The pilot aborted the landing and executed a go-around.

Air traffic control confirmed damage to the nose gear. The pilot elected to land with the gear down, and the nose gear collapsed during the landing roll.

Early Arrival Surprises Pilot

Cessna 402. Substantial damage. One minor injury.

The twin-engine Cessna 402 struck the ground 4.8 kilometers (three miles) before the approach end of the runway. The night instrument approach was flown through snow squalls and turbulence.

The pilot told accident investigators that he was surprised to find himself in unforecast instrument meteorological conditions (IMC). At the time the aircraft impacted terrain, the pilot believed he was above the minimum safe altitude of 300 feet (92 meters).

Rotorcraft

Helicopter Collides with Terrain During Attempted Takeoff

Hiller UH-12E. Substantial damage. No injuries.

The helicopter was engaged in aerial application work when it collided with terrain. The pilot reported that he had completed four application flights uneventfully and was taking off for a fifth flight when he lost control of the helicopter.

The helicopter sustained substantial damage when it impacted in a field. The pilot was not injured.

An investigation determined that two end caps from two main rotor blades separated and struck the tail-rotor blades. Weather at the time of the accident was reported as visual meteorological conditions (VMC) with clear skies and 24 kilometers (15 miles) visibility.

Helicopter Flies into the Ground Following Tracks in Dirt

Hughes 369. Aircraft destroyed. Minor injuries.

The pilot was maneuvering the helicopter close to the ground in a steep right turn looking at tracks in the dirt when it collided with terrain. The aircraft was destroyed, and the pilot received minor injuries.

An investigation found no mechanical malfunctions. Weather at the time of the accident was reported as clear skies and 32 kilometers (20 miles) visibility.

Helicopter Clips Trees in Coyote Chase

Schweizer 269C. Substantial damage. No injuries.

The pilot said that he was maneuvering the helicopter when it experienced a loss of rotor rpm (revolutions per minute) while hovering out of ground effect while chasing coyotes. He said there was insufficient altitude to recover the rotor rpm loss.

The helicopter impacted cedar trees and brush and came to rest on its side. The pilot and a passenger were not injured. Weather at the time of the accident was reported as clear with 16 kilometers (10 miles) visibility.

Engine Anomalies Lead to Hard Landing

McDonnell Douglas H-369. Substantial damage. One minor injury.

The helicopter was in cruise flight when the engine spooled down without warning. The pilot said that he heard the low-rpm (revolutions per minute) aural warning, but the engine relight activation light did not illuminate.

The pilot entered autorotation but did not bring the throttle to the off position. During the autorotation, the engine "spooled back up," the pilot said. Collective was applied and the helicopter began to climb, but the engine spooled down again. The pilot elected to complete the autorotation but made a hard landing after the engine spooled up again during the flare.

The helicopter struck trees, nosed over and came to rest inverted. The engine was still running after the helicopter came to rest, and the pilot shut it down. The pilot received minor injuries. Weather at the time of the accident was reported as visual meteorological conditions (VMC), 1,830 meters (6,000 feet) broken and winds at 20 knots (37 kilometers per hour), gusting to 30 knots (56 kilometers per hour).♦

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